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John J. Kelly, Jr.

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Examiner: A. Chambliss
Art Unit: 2814

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : K. TATSUMI, et al.
Serial No.: 09/254,119
Filed : April 16, 1999
For : SEMICONDUCTOR DEVICE PROVIDED WITH LOW MELTING POINT METAL BUMPS AND PROCESS FOR PRODUCING SAME

Assistant Commissioner
for Patents
Washington, D.C. 20231

AMENDMENT

SIR:

Kindly amend the above-identified patent application as follows.

In The Claims

--1. (Amended) A semiconductor device comprising electrodes formed on a semiconductor chip, and bumps each consisting of a spherically formed [low melting point] metal ball having a given size, and adhesive bonded to the electrodes,
each metal ball being formed from a solder used for mounting a semiconductor device on a substrate, and the metal balls having a radius R selected so that the following equation is satisfied:

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Conced

$$0.4\sqrt{A} \leq R \leq 2\sqrt{A}$$

wherein A is the surface area of the electrode.--

In claim 2, line 2, delete "low melting".

In claim 6, lines 6-7, delete "low melting point".

Cancel claims 7-15, without prejudice.

TITLE

Delete the current title of the application and replace it with the following new title: -- SEMICONDUCTOR DEVICE PROVIDED WITH LOW MELTING POINT METAL BUMPS--.

REMARKS

Reconsideration of the above-identified patent application, as amended, is respectfully requested. The present amendment is responsive to the Office Action mailed July 5, 2000.

The Office Action mailed July 5, 2000 did not set a shortened statutory period for reply. Thus, the time period for reply is six (6) months from the mailing date of July 5, 2000, i.e., January 5, 2001.

If the Office is of the opinion that an extension of time is required, applicants hereby petition under 37 C.F.R. §1.136(a) for any required extension of time. Please charge the extension fee for any required extension of time to Deposit Account No. 11-0600. Deposit Account charging authorization is provided in duplicate in the paper transmitting this amendment.

Amendment

Support for the amendment to independent claim 1 may be formed in the specification, e.g., at page 4, lines 33-35 and page 7, lines 25-31.

New matter is not being presented by the present amendment.

Restriction Requirement

Claims 1-6 are under consideration in this application. Claims 7-15 have been withdrawn from consideration due to a restrictive requirement. Claims 7-15 have been canceled without prejudice to the filing of a divisional application directed to claims 7-15. Such a divisional application has already been filed.

Specification

The Office Action objected to the title of the invention. In response to this objection, the title of the invention has been changed by the present amendment in accordance with the suggestion of the Office Action.

In view of the present amendment, it is respectfully requested that the objection of the title of the invention be withdrawn.

§112, ¶2

Claims 1-6 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Office Action objected to the phrase "low melting point".

By the present amendment, the phrase "low melting point" has been deleted where appearing in claims 1, 2 and 6.

In view of the present amendment, it is respectfully requested that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

§103

Claims 1-3 (inadvertently identified as 4-6) were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 6-333930 to Atsuhiko in view of U.S. Patent No. 5,833,128 to Kloeser et al.

Claims 4-6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 6-333930 to Atsuhiko in view of Japan No. 59-148352 to Hisao.

These rejections, as applied to the amended claims, are respectfully traversed.

It is submitted that none of the cited prior art references disclose or suggest the feature of the radius of the solder ball inserted into independent claim 1 by the present amendment.

It is therefore submitted that amended independent claim 1 is patentable over Japan No. 6-333930 to Atsuhiko in combination with either U.S. Patent No. 5,833,128 to Kloeser et al., or Japan No. 59-148,352 to Hisao.

Since claim 1 is patentable, claims 2 to 6 which depend from claim 1 are also patentable.

CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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